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MEETING REPORT FOR THE ANSN TECHNICAL MEETING

Vienna, Austria
3-5 February 2003

EXTRABUDGETARY PROGRAMME ON THE SAFETY OF NUCLEAR INSTALLATIONS IN THE SOUTH EAST ASIA, PACIFIC AND FAR EAST COUNTRIES

INTERNATIONAL ATOMIC ENERGY AGENCY

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1. Review of the current status of ANSN development

In August 2002 a consultation meeting was convened by the IAEA in Tokyo to discuss the technical basis for the establishment of the ANSN. Since then the hubs have been established in China, Japan, Korea, at the IAEA, and in the US, and activities have been initiated to implement a pilot project on Education & Training. The objective of the meeting held at the beginning of February 2003 in Vienna is to bring the efforts undertaken at the individual hubs together and to closer integrate the current and future activities.

More specifically the meeting aims at developing a roadmap of activities to implement the pilot project through the end of the year and to establish the communication paths between the participants in this effort.

2. Demonstration prototype web sites and development activities

A demonstration of the current implementation of a demonstration web site developed at the IAEA has been given. Later during the meeting it was decided to use this prototype as the starting point for further refinements of the user interface that allows for access to nuclear safety training and education materials. Similar presentations have been made by China, Korea, Japan, and the US.

The demonstrations of these prototyping activities were also used to introduce new participants in this project to the previous decisions and technical discussions.

The presentation of the Japanese activities showed that many of the previously developed recommendations were implemented and logically expanded to address some technical issues that were not obvious before the implementation of this prototype. The Japanese web site will be placed on a Linux server with an Apache web server, PHP scripting, and a MySQL database. It will be therefore similar to the configuration already in use at ANL.

The prototype implementation consist of the three tables representing the “GROUP”, “DOCUMENT”, and “ITEM” levels that were decided to be utilized based on the decisions from the Tokyo meeting. Mr. Yokoyama stressed the importance of keeping future extensibility of the system in mind, of providing enough flexibility to accommodate all relevant documents, and to improve the ease of maintenance.

The Korean presentation showed the basic plans for the implantation of a corresponding web server in Korea. At the current time, a web server or site prototype is not available, but significant planning has been done to implement such a site in the near future.

The equipment to be used in Korea consist of a Compaq Proliant 5500 Web Application and Database Server based on Windows NT 4.0, the ORACLE DBMS and web server, and a firewall appliance that protects this server adequately.

The Chinese presentation included a number of plans that have not yet been made by the other participants, for example the establishment of a local training center for expert consultation and training sessions for ANSN users. A schedule has been suggested with a preparation phase until March 2003, the establishment and preparation of a web server by September 2003, and a subsequent optimization of this system until December 2003.

The Chinese server will be connected to the Internet through an ADSL or DDN connection. The server will be, comparable to the Japanese and US sites, a 2GH PC Linux server, utilizing the same set of tools as being available at the other two sites.

A specialist from China will join the IAEA in February 2003 for one year to help with the development of the ANSN.

A further presentation of the IAEA Information Technology resources was given. The IAEA plan is to utilize readily available Microsoft tools for this effort, such as the IIS web server, and SQL-Server as the database engine. A short description of the network configuration was given to show the basic network layout.

3. Discussions on content and data formats

A discussion of electronic file formats was held, with special emphasis on the compatibility of several different electronic video formats. It was decided that most of these data format issues cannot be resolved within the framework of the data distribution task at hand. Rather, such issues should be addressed in form of guidelines to the preparers of future training materials.

It was also decided that the requirements for the concept should be more formally documented. Also, a number of test cases (“use cases”) should be developed to test the concept against typical usage patterns.

It was decided that such a requirements document should be developed, but that it was not required to go into extreme details.

Another document to be developed would be roadmap for the development of the ANSN, including a time schedule (Appendix 7).

4. Presentation of Mr. Yokoyama on the proposed database format

Mr. Yokoyama gave a presentation of his work on a prototype database implementation. This is based on the recommendations and suggestions by Mr. Ley at the Tokyo

meeting in August 2002. A refinement of the attributes led to a rather final decision on the table design at the end of the meeting.

Emphasis was on keeping the attributes flexible instead of implementing them with tight restrictions. The concept of fixed and variable attributes was introduced. Fixed attributes are readily assignable to any data entry, while flexible attributes could be added on an adhoc basis when necessary.

The proposal is to handle the taxonomy separately from the implementation of the document attributes. While many document attributes are invariable, such as title and author, the proposed taxonomy represents one of a number of possible paths to a logical breakdown of the database content.

Another important aspect is the clarification of terms to avoid misunderstandings.

5. General Discussion

A general discussion was held on the appearance of the user interface, and the most logical ways for a user to find the needed information in the proposed system. It was agreed upon that there is a clear need for a search capability by multiple criteria. A decision was made to provide two types of search entries, in form of a quick search implementation with predefined settings, and an advanced search that allows for a great deal of control over the search process.

A recommendation was made to include always the original formats of any document posted into the system, if available. This seems necessary to support the proposed end user, typically an expert trying to find materials to create a training course.

Discussions were held to introduce new members to the idea of the master index server. The master index server will receive the locally entered data in form of a copy of records into the individual local databases. This record collection process can be fully automated. The use of a single master index has a number of advantages in terms of development: It requires less effort for the individual nodes, presents a single user interface to the user, and can be developed relatively quickly.

Network security was another topic of the discussion. Several methods of providing encryption capabilities to the data transfer between the sites were discussed. It was decided that such advanced security methods were not necessary within the pilot project, but that current design decisions should be made with consideration of future advanced security features. This seems to be relatively easy, since much of the security strategy currently being develop can be wrapped around existing insecure data transmission protocols.

Another topic was the format of data transmission. Due to the different national languages, the encoding of character sets and other problems of international language implementation need to be addressed. Also, the data transfer process has to be easily

implemented on a number of different hardware and software platforms. It was agreed upon to use XML as the basic data format, and that all communication between the nodes should be using the HTTP port 80 (this avoids any interference with firewalls and existing security tools.

6. Basic table definitions

The discussion went back to the document attributes and the expected complexity. Each attribute was analyzed, and a decision was made on the basic format, and on which level it should be applied. The levels are:

Group	or Course
Document	or Lecture
Item	or File (if electronically available)

The following basic table definitions were agreed upon (only subject to minor changes):

Group Table

Group_ID	Integer, primary key, unique, required
Title	Text, e.g. a course name
Description	Text, a description of the collection of documents
Organization	Text, the organization responsible for the collection
Date	Date, the date associated with the collection, if any
Timestamp	Date, identifying the last update of this record
Node	Text, identifying the ANSN hub that created this record

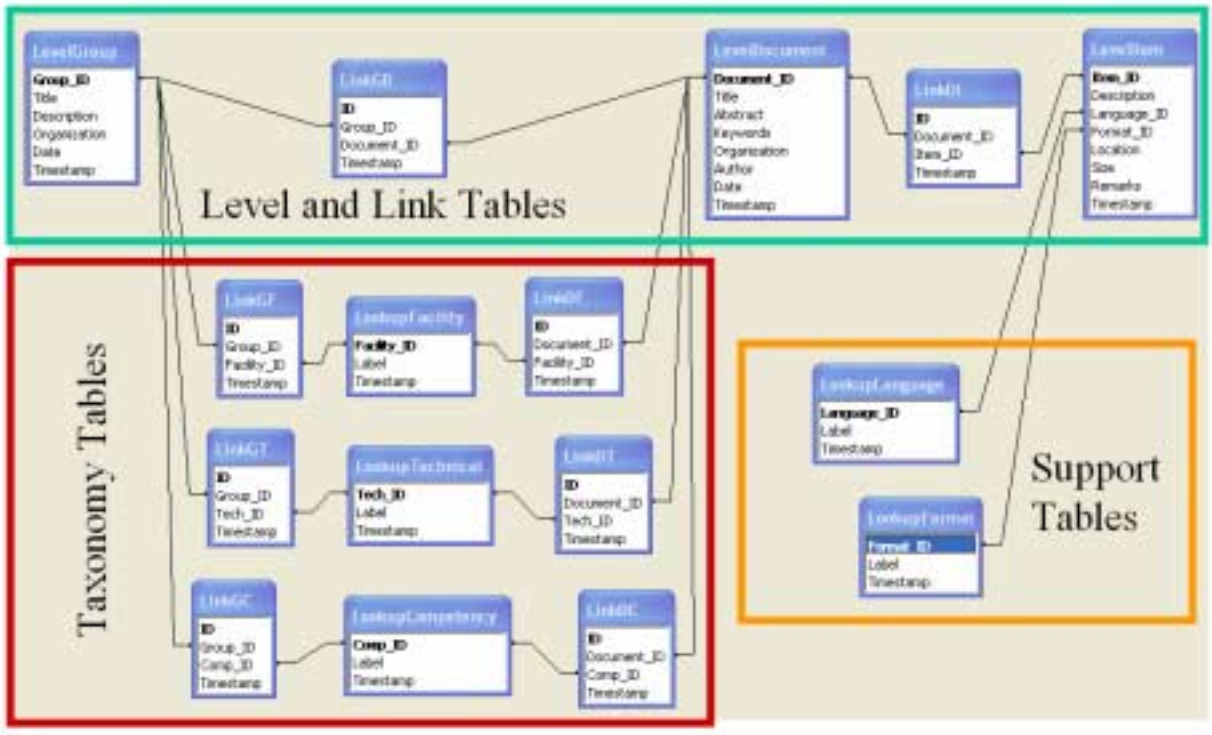
Document Table

Document_ID	Integer, primary key, unique, required
Title	Text, e.g. a training class name
Abstract	Text, abstract or a description the of the document
Keywords	Text, a comma-separated list of keywords
Organization	Text, the organization(s) responsible for the document
Author	Text, the author(s) of the document
Date	Date, the date associated with the document, if any
Timestamp	Date, identifying the last update of this record
Node	Text, identifying the ANSN hub that created this record

Item Table

Item_ID	Integer, primary key, unique, required
Description	Text, describing the item
Language	Text, single entry, lookup from a language name table
Format	Text, single entry, lookup from a media format table
Location	Text, URL to file on server
Size	Integer, in kB, size of the file/item if electronic media
Remarks	Text, allows for a detailed description if necessary
Timestamp	Date, identifying the last update of this record
Node	Text, identifying the ANSN hub that created this record

A number of support tables will be necessary to complete this conceptual design, for example the two link tables to represent the many-to-many relationships between the three logical levels. Also, a number of common lookup tables will be needed to assure that data entry will be consistent between nodes. For example, to standardize country names, a lookup table for the most common language will be defined, which can the in turn be used to establish pull-down menus and similar tools to simplify data entry and retrieval. At this time, the complete set of tables will look similar to the ones shown in the following figure.



While the naming conventions are not fixed yet (table and field names are possibly subject to changes), the above figure demonstrates the basic layout of a database at the individual hubs. The tables can be grouped by two different measures. The first grouping is expressed in the beginnings of all table names. For example, all tables containing the main entries are starting with “Level…”, all tables used to establish many-

to-many relationships are staring with “Link…”, and all tables that provide common lookup information are starting with “Lookup…”. The other grouping is expressed through the boxes in the above figure. This leads to a differentiation by function. For example, level and link tables provide the backbone of the structure and describe the relationships between the entries on the different levels (items within documents, documents within groups). Taxonomy tables are use to attach the suggested taxonomy in form of lookup tables. Link tables between the group as well as the document levels and the corresponding taxonomy category tables allow for multiple choice classification and subsequent retrieval in the three dimensions of the taxonomy scheme. The third box, for support tables, adds some functionality to ensure that media types (formats) are identically applied throughout the ANSN hubs, and that language names are identical and selectable through pull-down menus.

Additional improvements can be envisioned for the future, for example through the introduction of lookup tables for authors and organizations. While valuable for search (and enforcing a more consistent data entry), these lookup tables would require additional protocols to ensure that authors and organizations are consistently added to the lookup tables by data entry personnel. The currently included lookup tables are rather static and will hardly ever be updated after being built during the intital development.

While the above tables reflect the definitions for typical hub databases, the master index database would be mostly identical. While the lookup tables are static and identical on all hubs (and in fact should be modified only very carefully on the master index server and then propagated to the hubs), all other tables will be constantly locally modified. Those local changes have to be retrieved by the master index server and implemented in the master index. For that reason, all tables other than the lookup tables (specifically all the level and the link tables) have to be implemented each with an additional field on the master index to allow the tracking of the records’ origins. Otherwise, the tables on the master index and the individual hubs can be identical.

There is no technical reason why the tables couldn’t include additional fields on the hubs. For example, fields could be added for tracking data entry personnel and revision numbers. They could also contain fields to identify the source of uploaded information, or locations of originals in paper or film format, comments with regards to the classification with the established taxonomy, and much more. As a matter of fact, the only requirement is that the tables on the individual hubs provide at least the specified fields and relationships to ensure interoperability. Further refinements can be made, and may lead to improved strategies for future implementation over there entire network.

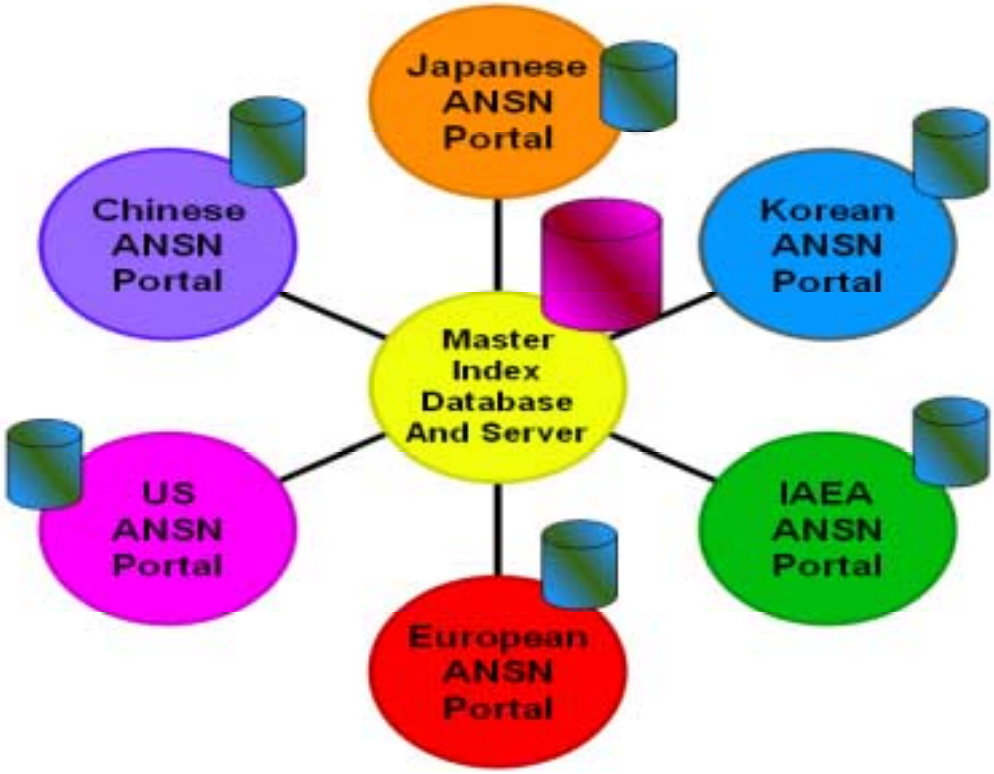
Another discussion followed on the classification strategies considered so far in this project. For example, a data entry person may classify materials differently from a potential user of the system, making it difficult to retrieve the material intended by he user when searching by classification.

With regards to the attributes “area of competency” and “technical area”, it became obvious, that the classification into categories need to be more rigorously examined, reducing the number of groups making them more exclusive against each other. Also, during data entry as well as searching, the data entry person and the end user should be able to classify the document as well as the search broader than a single choice of category. Therefore, the database needs to be designed to be flexible enough to accommodate such multiple choices (see Appendix 4), during data entry as well as search. At the time of data entry, a decision is less restricted if a document can be placed into more than one category, and at search time, the user may be less capable of knowing the possible placement strategy at data entry. While the search gets broadened this way, it is more inclusive and the chances of missing an important document are smaller.

Following the suggestions of Mr. Yokoyama, the reduction and clarification of categories has been analyzed. The “technical area” has been also subdivided into more detailed categories The lists of minor categories can now be used in form of guidelines at data entry, and in form of clarification of details at the search time (Appendices 1 to 3).

The meeting then broke into two groups to develop a more refined taxonomy based on Mr. Yokoyamas’s prototype, while the other group started the work on a breakdown of activities and a time schedule for the implementation of the project.

7. Relationship of hubs and master index



Each hub will provide its own portal based on local needs and preferences. Also, each hub will develop a compatible database to store local index information. The entered index information is automatically retrieved by the master index server on a regular basis. The master index server composes the information from the individual nodes into a single master index that is being used for searching and presentation of the documents in the ANSN network. Ownership of the contributions from the various nodes is maintained, with master server updating its contents only by means of automatic polling of the other nodes for changes of this information.

Each one of the ANSN nodes will refer search or other access to the collection of ANSN documents to the master index server. The master index server constitutes a shared resource of the ANSN. In the future, the system could be expanded into additional nodes providing a master index for alternative search engines or access strategies to the current master index. Nevertheless, such activities are beyond the pilot phase of this project. Therefore, for the time being, the search pages will be only located on the master index server (also named search site).

An important issue is the data transfer between the master index server and the individual nodes on the network. One of the proposed methods is to format the data

according to the open XML standard. The data can then be exposed by the individual nodes in form of protected files (URLs) for subsequent retrieval by the master index server. This mechanism provides only for regular polling of changed content, but is easy to implement due to the transport through the web-based HTTP protocol, which is already open in all of the firewalls. Other protocols that allow for the immediate update of the master index server (by push methods) may be used alternatively and are subject to further evaluation.

In any event, it is essential to include a number of sanity checks that run on a regular basis to check whether the content of the master server is internally consistent and identical to the hubs at any time. Such checks could search for orphaned records or files on the servers, and would later the administrators to potential problems. Specific sanity checks will have to be developed later during the project implementation.

8. User registration and account sharing

There should also be an implementation of a user registration and sign-up mechanism at each node. The other nodes accept the registration of users on any other node, making it necessary to establish an account information sharing system. A prototype based on basic HTTP authentication has been already developed at ANL. This prototype could be the basis for a general account information scheme working on all hardware and software platforms used at the ANSN nodes. Further analysis will show whether this approach is feasible, or whether additional methods have to be researched. The disadvantage of the currently suggested method is that users would have to reenter their account information when referred from one node to another. While inconvenient for the user, this may be acceptable if a more sophisticated account sharing methodology proves to be too costly to implement.

9. Data entry interface and procedures

All databases that are being planned for use at the ANSN nodes are locally accessible from Microsoft Access through generic or database-specific interfaces. Therefore, with relatively small effort, a common data entry interface could be developed by using Microsoft Access. This could then be replicated and used at all nodes for data entry, allowing for the development of a single date entry user interface and saving some development resources.

Also, guidelines should be developed to standardize the classification according to the taxonomy being developed under this project. These guidelines will ensure that the different data entry personnel will classify and enter documents in a consistent manner.

10. Breakdown of the project into individual tasks

The tables on the following pages show the breakdown of tasks in logical building blocks that can be turned into a time schedule (see Attachment 7). A similar assessment of the needed resources and development steps needs to be developed for each individual hub, and critical paths have to be derived from the combined time schedules to determine the significance of certain development steps.

The tables on the following pages should be considered a very preliminary breakdown of the tasks at hand. While many of the entries reflect activities that have to be performed at each hub, some apply only to the master index server. Critical path analysis will show which parts are critical to the overall success of the project, and what milestones need to be accomplished.

Category	Individual Components	Involved Organizations	Estimated Duration
IT Environment	Server (Hardware) Operating System Database Management System Web Sever Backup Strategies Network Connections IP Address Assignment Domain Name Firewall Data Storage Capacity Local Policies Personnel Communication	All hubs	2 months
Web Design	Acquisition of development tools Basic web site layout Processing of account requests Authentication of registered users Help / News / About pages Link to the master search site Basic web site navigation concept Links to other hubs Contact information Optional statistics on usage	All hubs	4 months
Database Development	Assessment of OS, DBMS, servers, and scripting capabilities Create database (installation, configuration) Create ANSN database tables and structure, relationships Basic V&V with test data Development or identification of import/export XML tools	Start with IAEA and ANL, then others	1 month
Data Storage	Capacity planning Structuring of directory tree for document storage Configuration of internal data access and transfer	All hubs	½ month

Category	Individual Components	Involved Organizations	Estimated Duration
	Policies and guidelines for data entry and placement		
Data Exchange	Unambiguous definition of XML transfer file format Tools to generate XML representation of data on demand Tools to request XML data and for import into local DB Strategies to ensure reliable synchronization Verification rules to detect inconsistent data Vulnerability assessment (security, reliability)	Initially ANL and IAEA, then others	2 months
Shared User Authentication	Assessment of available technical solutions Determination of critical limitations Assessment of local account and computer usage policies Implementation and testing	Initially ANL, then IAEA, then others	3 months
Search and Document Retrieval	Assessment of taxonomy with regards to search capabilities Quick search (comparable to IAEA and Japanese prototypes) Advanced search with multiple options and multiple choices Exclusion of full text search for the pilot project Retrieval and visual presentation of search results	IAEA with support from other hubs	3 months
Communication of Developers	Establishment of a news group or similar tool Identification of technical and administrative key contacts Identification of Email groups Evaluation of video conferencing capabilities and needs Establishment of temporary accounts for participants at hubs	ANL and IAEA, with support from others	½ month
Security	Basic authentication by password sufficient for pilot project Identification of critical issues for future security upgrades	IAEA, ANL, then others	1 month
Data Entry	Development of a front-end application for data entry Assessment of shared data entry tool for distribution	?	1 month

This table is very preliminary and serves as a rough breakdown of the expected development tasks. It is subject to further refinement and significant change.

11. Other topics

At the meeting in Korea, it should be determined how people from the other countries can support the development of the proposed system, for example by serving as test users.

Also, it is necessary to learn about the capabilities and technical or communication problems in the other countries to find possible technical solutions. This includes hardware and software environments, network connections, the actual location of the national centers, and language-specific problems.

Also, it is necessary to address quality assurance issues. Minimum standards and procedures should be used as guidelines or authoritative documents to ensure a certain minimum quality of the classification and presentation of the materials posted on this system. A quality assurance document will be prepared by the GRS for review by the ANSN participants (Appendix 5).

A number of use cases will have to be developed to test prototypes for applicability and shortcomings. This strategy will improve the quality of the search and access interface and bring it in line with user demands (Appendix 6).

By the time of the meeting in Korea by the end of March, each country should have a more precise list of the materials to be placed into the system. This will allow for a better estimate as the basis for capacity planning and development strategies.

Appendix 1: Taxonomy - Definition of Technical Areas

Technical Area		Examples of Topics Categorized into Each Technical Area	
1	Basic Nuclear Technology & Engineering	• Nuclear physics • Neutronics, reactor physics and kinetics • Thermal hydraulics and heat transfer	• Nuclear engineering principles • Radiation and radiology • Radiation protection and health physics.
2	Materials Technology	• Structural materials	• Corrosion
3	Nuclear Facility Planning & Design	• Design requirements • Pre-design engineering • Conceptual, basic and detailed design • Siting and plant planning • System and component design (fuel & core, reactor systems, BOP systems, I&C, electrical systems) • Building & layout design	• Safety design (safety significance classifications, seismic design, shielding design) • Design calculations (Structural analysis) • Special design considerations (fire protection, external events) • Computer code development and verification • Criticality safety
4	Safety Analysis & Assessment	• Safety principles and philosophy • Deterministic safety analysis (transient analysis, accident analysis, seismic analysis) • Probabilistic safety assessment	• Computer code development and verification • Severe accident and accident management • Radiological/exposure evaluation • Safety of experiments
5	Facility Construction & Commissioning	• Construction schedule and management • Project management • Construction / installation methods	• System /component testing and inspection • Preoperational and commissioning tests
6	Facility Operation & Maintenance	• Operational management (organization, safety management, quality management) • Plant maintenance, inspection, repair and modification • Operational experience • Plant performance evaluation • Events, Incidents and accidents	• Ageing management • Radiation / exposure control • Environmental monitoring • Personnel education, training and qualification • Operational limits and conditions • Fuel management • Chemistry
7	Fuel Technology	• Fuel materials • Fuel design	• Irradiation tests
8	Spent Fuel & Radioactive Waste Management	• On-site spent fuel and radioactive waste management	• Transportation of spent fuel, radioactive waste and radioactive materials
9	Safe Shutdown & Decommissioning	• Facility decommissioning	• Decommissioning technologies
10	Others	• Nuclear technology general • Nuclear terminology	• General technical evaluation • General technical trends and statistics

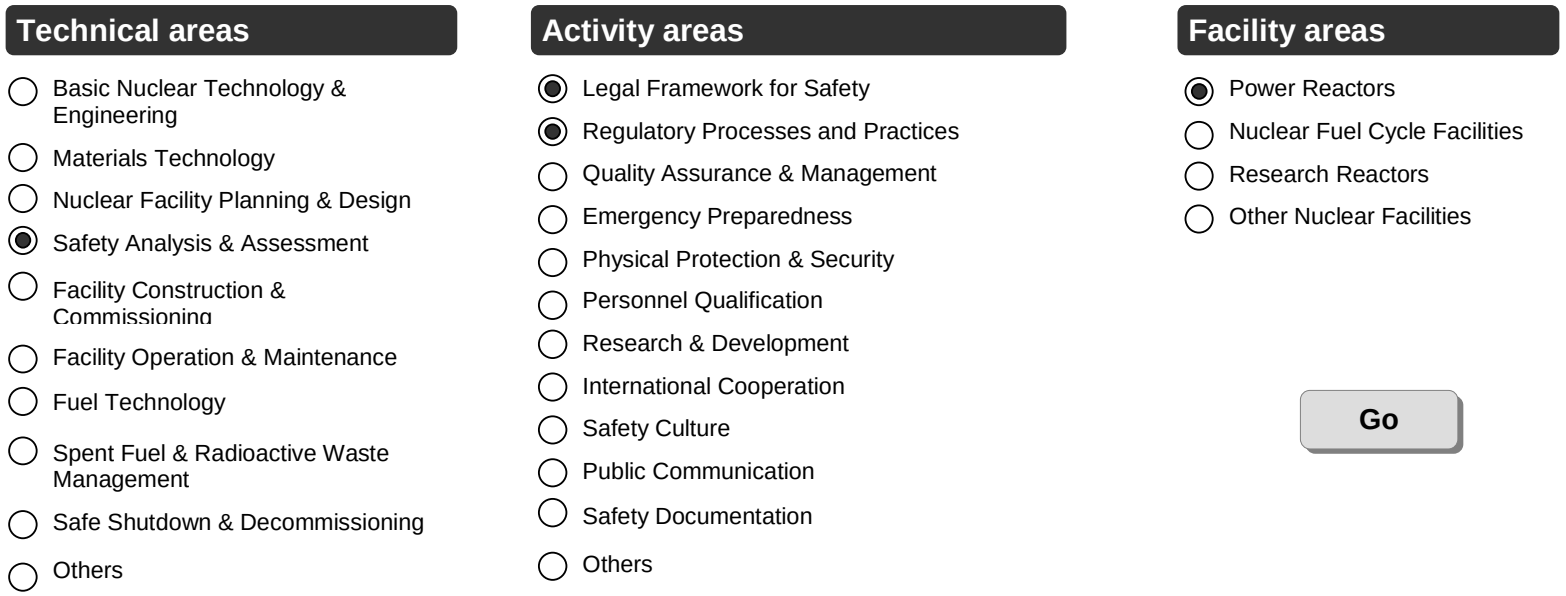
Appendix 2: Taxonomy – Definition of Activity Areas

Activity Area		Examples of Topics Categorized into Each Activity Area	
1	Legal Framework for Safety	• Laws & regulations • Regulatory organization	
2	Regulatory Processes and Practices	• Safety review and assessment • Regulatory activities during facility construction and commissioning • Safety regulation of operating facilities (event reporting, periodical inspection, safety inspection, in-service inspection, periodical safety review, licensing of plant modification, personnel qualification)	• Licensing processes • Safety Codes and Guides • Safety Research
3	Quality Assurance & Management	• Quality assurance for plant life-time • Quality management for regulatory activities	
4	Emergency Preparedness	• Emergency response plan and organizations (on-site, off-site) • Emergency response support systems	• Emergency drill / exercise
5	Physical Protection & Security	• Physical protection	• Vital area assessment for nuclear facilities
6	Personnel Qualification	• Assessment of competence needed • Training Programmes	• Simulators
7	Research & Development	• Safety Research and Development • International Research and Development Programmes	
8	International Co-operation	• International conventions and agreements • International organizations	• IAEA Safety Standards • Other International Safety Documents
9	Safety Culture	• Stages of Development • Self-Assessment	• Practces
10	Public Communication	• Communication with society / public • Public Information Documents • Public Information Meetings	• Information Systems • Seminars
11	Safety Documentation	• SAR • Operational Documents	• Environmental Reports
12	Others		

Appendix 3: Taxonomy – Definition of Facility Areas

Facility Area		Examples of Topics Categorized into Each Facility Area	
1	Power Reactors	• Light water reactor facilities • Non-light water reactors	• Future power reactors
2	Nuclear Fuel Cycle Facilities	• Fuel mining and refining facilities • Fuel fabrication facilities • Off-site spent fuel storage facilities	• Off-site radioactive waste management and disposal facilities • Transportation of nuclear fuel and radioactive materials
3	Research Reactors	• Research and test reactors • Reactors for RI production, irradiation and neutron flux utilization	
4	Other Nuclear Facilities	• Radioisotope facilities • Radiation source facilities	

Appendix 4: Taxonomy – Using Multiple Choices in Searching



Search with taxonomy (Tech. Area – Activity area – Facility area)

Appendix 5: Quality Assurance

The following is an outline of a document that is to be provided by the GRS in an effort to establish common quality measures and to assure minimum standards on the choice and content of materials distributed through the ANSN.

PROCEDURES FOR ASSURING QUALITY OF INFORMATION INPUT TO ASIAN NUCLEAR SAFETY NETWORK (ANSN)

Assignment of responsibilities and nomination of a quality manager, and an information technology manager.

- The quality manager is responsible to ensure technical quality and the input process for all information to be transmitted to the ANSN.
- The information technology (IT) manager is responsible for transmission of information, its availability and maintenance.

1. Technical Quality

- check usefulness for ANSN users
- check if information is still valid and up-to-date for inclusion in the ANSN
- check completeness and correctness of attributes assigned at all levels (e.g. technical areas, activity areas, keywords)
- check copyrights
- check readability (quality of scanned documents, audio/video files)
- approval by hub quality managers

2. Input Process Quality

- data entry – adherence to the ANSN classification system (attributes)
- approval by nominated hub quality manager

Appendix 6: Use Cases for Validation of Search Concepts

The following is an example for a use case. More of these cases will be developed to test the search and retrieval user interface against typical needs of a user of the ANSN.

USE CASE (scenario)

Case 1:	a) User wants to know all courses in one facility area (e.g. research reactor)
Results:	list of course titles
	b) Select one course
Results:	abstract and table of contents (document)
	c) Select one part of the table of contents
Results:	lecture (items) associated
	d) Select one item
Results:	display